SBIR

Small Business Innovation Research

FY 2001

NOAA PROGRAM SOLICITATION

Closing Date: January 17, 2001

October 2000 NOAA 2001-1

U.S. DEPARTMENT OF COMMERCE

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http://www.oar.noaa.gov/ORTA/SBIR

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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

1.0 PROGRAM DESCRIPTION

1.1 Introduction

The Department of Commerce (DOC) National Oceanic and Atmospheric Administration (NOAA) invites small businesses to submit research proposals under this solicitation. Firms with strong research capabilities in any of the areas listed in Section 8 of this solicitation are encouraged to participate. **Unsolicited proposals are not accepted under the Small Business Innovation Research (SBIR) program**.

Objectives of this program include stimulating technological innovation in the private sector and strengthening the role of small business in meeting Federal research and development (R&D) needs. This program also seeks to increase the commercial application of innovations derived from Federal research and improve the return on investment from Federally-funded research for the economic benefit of the Nation.

1.2 Three-Phase Program

The "Small Business Research and Development Enhancement Act of 1992" requires the Department of Commerce to establish a three-phase SBIR program by reserving a percentage of its extramural R&D budget to be awarded to small business concerns for innovation research.

The funding vehicles for NOAA's SBIR program in both Phase 1 and Phase 2 are contracts. This document solicits Phase 1 proposals only.

NOAA has the unilateral right to select SBIR research topics and awardees in both Phase 1 and Phase 2, and to award several or no contracts under a given topic.

1.2.1 Phase 1 - Feasibility Research

The purpose of Phase 1 is to determine the technical feasibility of the proposed research and the quality of performance of the small business concern receiving an award. Therefore, the proposal should concentrate on research that will significantly contribute to proving the feasibility of the proposed research, a prerequisite to further support in Phase 2.

1.2.2 Phase 2 - Research and Development

Only firms that are awarded Phase 1 contracts under this solicitation will be given the opportunity of submitting a Phase 2 proposal immediately following completion of Phase 1.

Phase 2 is the R&D or prototype development phase. It will require a comprehensive proposal outlining the research in detail. Further information regarding Phase 2 proposal requirements will be provided to all firms receiving Phase 1 contracts.

1.2.3 Phase 3 - Commercialization

In Phase 3, it is intended that non-SBIR capital be used by the small business to pursue commercial applications of Phase 2.

1.3 Eligibility

Each organization submitting a proposal **must** qualify as a small business (Section 2.1) for research or R&D purposes (Section 2.2). In addition, the primary employment of the principal investigator must be with the small business at the time of the award. More than one-half of the principal investigator's time must be spent with the small business for the period covered by the award. **Primary employment with a small business precludes full-time employment with another organization.**

Also, for both Phase 1 and Phase 2, the work must be performed in the United States. "United States" means the fifty states, the territories and possessions of the United States, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, and the District of Columbia.

Joint ventures and limited partnerships are eligible, provided the entity created qualifies as a small business as defined in this solicitation. **Consultative arrangements between firms and universities or other non-profit organizations are encouraged, with the small business serving as the prime contractor.**

1.4 Contact with NOAA

In the interest of competitive fairness, oral or written communication with NOAA or any of its components concerning additional information on the technical topics described in Section 8 of this solicitation **is prohibited**.

Requests for general information on the NOAA SBIR program may be addresses to:

Dr. Joseph M. Bishop, NOAA SBIR Program Manager
1315 East-West Highway
Silver Spring, 20910-3232
Telephone: (301) 713-3565, Fax: (301) 713-4100
E-mail: joseph.bishop@noaa.gov

Information sources and/or document services are listed in Section 7.

2.0 DEFINITIONS

2.1 Small Business

A small business concern is one that, at the time of award for Phase 1 and Phase 2:

(a) is independently owned and operated, is organized for profit, is not dominant in the field of operation in which it is proposing, and has its principal place of business located in the United States (Section 1.3);

(b) is at least 51 percent owned, or in the case of a publicly owned business, at least 51 percent of its voting stock is owned by United States citizens or lawfully admitted permanent resident aliens; and

(c) has, including its affiliates, a number of employees not exceeding 500, and meets the other small business regulatory requirements found in 13 Code of Federal Regulations Part 121. Business concerns are affiliates of one another when, either directly or indirectly, (1) one concern controls or has the power to control the other, or (2) a third party controls both. Control can be exercised through common ownership, common management, and contractual relationships. Business concerns include, but are not limited to, any individual, partnership, joint venture, association, or cooperative.

2.2 Research or Research and Development

Any activity that is (a) a systematic, intensive study directed toward greater knowledge or understanding of the subject studied; (b) a systematic study directed specifically toward applying new knowledge to meet a recognized need; or (c) a systematic application of knowledge toward the production of useful materials, devices, services, or methods, and includes design, development, and improvement of prototypes and new processes to meet specific requirements.

In general, the NOAA SBIR program will fund Phase 1 and 2 proposals with objectives that can be defined by (b) and (c) above.

2.3 Socially and Economically Disadvantaged Small Business Concern

Is one that is:

(a) at least 51 percent owned by (1) an American Indian tribe or a native Hawaiian organization, or (2) one or more socially and economically disadvantaged individuals, and

(b) controlled by one or more such individuals in its management and daily business operations.

A socially and economically disadvantaged individual is defined as a member of any of the following groups: Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent Asian Americans, or any other individual found to be socially and economically disadvantaged by the Small Business Administration (SBA) pursuant to Section 8(a) of the Small Business Act, 15 U.S. Code (U.S.C.) 637(a).

2.4 Women-Owned Small Business

A small business that is at least 51 percent owned by a woman or women who also control (meaning to exercise the power to make policy decisions) and operate (meaning being actively involved in the day-to-day management) the small business.

2.5 Subcontract

This is any agreement, other than one involving an employer-employee relationship, entered into by a Federal Government funding awardee, calling for supplies or services required solely for the performance of the original funding agreement.

2.6 Commercialization

This is locating or developing markets and producing and delivering products for sale (whether by the originating party or by others). As used here, commercialization includes both Government and private sector markets.

3.0 PROPOSAL PREPARATION

3.1 Proposal Requirements

The objective is to provide sufficient information to demonstrate that the proposed work represents a sound approach to the investigation of an important scientific or engineering innovation worthy of support. **The proposal must meet all the requirements of the subtopic in Section 8 to which it applies**.

A proposal must be self-contained and written with all the care and thoroughness of a scientific paper submitted for publication. It should indicate a thorough knowledge of the current status of research in the subtopic area addressed by the proposal. Each proposal should be checked carefully by the offeror to ensure inclusion of all essential material needed for a complete evaluation. The proposal will be peer reviewed as a scientific paper (all units of measurement should be in the metric system).

NOAA reserves the right not to submit to technical review any proposal which it finds to have insufficient scientific and technical information, or one which fails to comply with the administrative procedures as outlined on the Checklist of Requirements in Section 9.

The proposal must not only be responsive to the specific NOAA program interests described in Section 8 of the solicitation, but also serve as the basis for technological innovation leading to new commercial products, processes, or services that benefit the public. An organization may submit different proposals on different subtopics or different proposals on the same subtopic under this solicitation. When the proposed innovation applies to more than one subtopic, the offeror must choose that subtopic which is most relevant to the offeror's technical concept.

Proposals principally for the commercialization of proven concepts or for market research must not be submitted for Phase 1 funding, since such efforts are considered the responsibility of the private sector.

The proposal should be direct, concise, and informative. Promotional and other material not related to the project shall be omitted. **The Phase 1 proposal must provide a description of potential commercial applications.**

3.2 Phase 1 Proposal Limitations

- **!** Page Length - **no more than 25 pages**, consecutively numbered, including the cover page, project summary, main text, references, resumes, any other enclosures or attachments, and the proposal summary budget.
- **!** Paper Size - must be 21.6 cm X 27.9 cm (8 ½" X 11").
- **!** Print Size - **must be easy to read with a fixed pitch font of 12 or fewer characters per inch or proportionally spaced font of point size 10 or larger with no more than 6 lines per inch.**

Supplementary material, revisions, substitutions, audio or video tapes, or computer floppy disks will **not** be accepted.

Proposals not meeting these requirements will be returned without review.

3.3 Phase 1 Proposal Format

3.3.1 Cover Sheet

Complete Section 9 "Cover Page" as page 1 of each copy of each proposal. **NO OTHER COVER WILL BE ACCEPTED.** Xerox copies are permitted.

3.3.2 Project Summary

Complete Section 9 "Project Summary" as page 2 of your proposal. The technical abstract should include a brief description of the problem or opportunity, the innovation, project objectives, and technical approach.

In summarizing anticipated results, include technical implications of the approach (for both Phase 1 and 2) and the potential commercial applications of the research. **The Project Summary of proposals that received an award will be published by NOAA and, therefore, must not contain proprietary information.**

3.3.3 Technical Content

Beginning on page 3 of the proposal, include the following items with headings as shown:

(a) **Identification and Significance of the Problem or Opportunity.** Make a clear statement of the specific research problem or opportunity addressed, its innovativeness, commercial potential, and why it is important. Show how it applies to a specific subtopic in Section 8.

(b) **Phase 1 Technical Objectives.** State the specific objectives of the Phase 1 effort, including the technical questions it will try to answer, to determine the feasibility of the proposed approach.

(c) **Phase 1 Work Plan.** Include a detailed description of the Phase 1 R&D plan. The plan should indicate not only what will be done, but where it will be done, and how the R&D will be carried out. The methods planned to achieve each objective or task should be discussed in detail. **This section should be at least one-third of the proposal.**

(d) **Related Research or R&D.** Describe research or R&D that is directly related to the proposal, including any conducted by the principal investigator or by the proposer's firm. Describe how it relates to the proposed effort, and describe any planned coordination with outside sources. The purpose of this section is to persuade reviewers of the proposer's awareness of recent developments in the specific topic area.

(e) **Key Personnel and Bibliography of Related Work.** Identify key personnel involved in Phase 1, including their related education, experience, and publications. Where resumes are extensive, summaries that focus on the most relevant experience and publications are suggested. List all other commitments that key personnel have during the proposed period of contract performance.

(f) **Relationship with Future R&D.** Discuss the significance of the Phase 1 effort in providing a foundation for the Phase 2 R&D effort. Also state the anticipated results of the proposed approach, if Phases 1 and 2 of the project are successful.

(g) **Facilities and Equipment.** The conduct of advanced research may require the use of sophisticated instrumentation or computer facilities.

The proposer should provide a detailed description of the availability and location of the facilities and equipment necessary to carry out Phase 1.

(h) **Consultants and Subcontracts.** The purpose of this section is to convince NOAA that: (1) research assistance from outside the firm materially benefits the proposed effort, and (2) arrangements for such assistance are in place at the time the proposal is submitted.

Outside involvement in the project is encouraged where it strengthens the conduct of the research; such involvement is not a requirement of this solicitation.

1. Consultant - A person outside the firm, named in the proposal as contributing to the research, must provide a signed statement confirming his/her availability, role in the project, and agreed consulting rate for participation in the project. *This statement is part of the page count.*

2. Subcontract - Similarly, where a subcontract is involved in the research, the subcontracting institution must furnish a letter signed by an appropriate official describing the programmatic arrangements and confirming its agreed participation in the research, with its proposed budget for this participation. *This letter is part of the page count.*

(i) **Potential Commercial Application and Follow-on Funding Commitment.** Describe in detail the commercial potential of the proposed research, how commercialization would be pursued, and potential use by the Federal Government.

(j) **Cooperative Research and Development Agreements (CRADA).** State if the applicant is a current CRADA partner with NOAA, or with any other Federal agency, naming the agency, title of the CRADA, and any relationship with the proposed work.

(k) **Guest Researcher.** State if the applicant is a guest researcher at NOAA, naming the sponsoring laboratory.

(l) **Cost Sharing.** Cost participation could serve the mutual interest of NOAA and certain SBIR contractors by helping to assure the efficient use of available resources. Except where required by other statutes, NOAA does not encourage or require cost sharing on Phase 1 projects, nor will cost sharing be a consideration in evaluation of Phase 1 proposals.

3.4 Equivalent Proposals or Awards

A firm may have received other SBIR awards or elected to submit essentially equivalent proposals under other SBIR program solicitations. In these cases, a statement **must** follow the Technical Content section in the proposal indicating:

(a) the name and address of any agency to which a proposal was submitted or from which an SBIR award was received;
(b) the date of proposal submission or date of award;
(c) the title, number, and date of the SBIR program solicitation under which a proposal was submitted or award received;
(d) the title of the research project; and
(e) the name and title of the principal investigator for each proposal submitted or award received.

If no equivalent proposal is under consideration or equivalent award received, a statement to that effect **must** be included in this section.

3.5 Prior SBIR Phase 2 Awards

If a small business concern has received one or more Phase 2 awards from any of the Federal agencies in the prior 10 fiscal years, it must submit on a separate page, the names of awarding agencies, dates of awards, funding agreements numbers, amounts, topics or subtopic titles, follow-on agreements amounts, sources and dates of commitments, and current commercialization status for each Phase 2. *This required information shall not be part of the page count limitation.*

3.6 Proposed Budget

Complete the "SBIR Proposal Summary Budget" (Section 9) for the Phase 1 effort, and include it as the last page of the proposal. Some items of this form may not apply. Enough information should be provided to allow NOAA to understand how the offeror plans to use the requested funds if the contract or grant is awarded. A complete cost breakdown should be provided giving labor rates, proposed number of hours, overhead, G&A, and profit. A reasonable profit will be allowed. When proposing travel, identify the number of trips, people involved, labor categories, destination of travel, duration of trip, commercial air fare or mileage rate, per diem expenses, and purpose of travel. Budgets for travel funds must be justified and related to the needs of the project.

Where equipment is to be purchased, list each individual item with the corresponding cost. The inclusion of equipment will be carefully reviewed relative to need and appropriateness for the research proposed. Equipment is defined as an article of nonexpendable, tangible property having a useful life of more than 1 year and an acquisition cost of $5,000 or more per unit.
Title to equipment will be vested with NOAA, unless it is determined that transfer of title to the contractor would be more cost effective than recovery of the equipment. Equipment purchased with NOAA funds will be inventoried by NOAA.

SBA Policy requires that NOAA not issue SBIR awards that include provisions for subcontracting any portion of the contract back to the originating agency or any other Federal agency.
For Phase 1, a minimum of two-thirds of the research and/or analytical effort must be performed by the proposing firm. The total cost for all consultant fees, facility leases, usage fees, and other subcontract or purchase agreements may not exceed one-third of the total contract. For Phase 2, one-half of the research and/or analytical effort must be performed by the proposing firm.

4.0 METHOD OF SELECTION AND EVALUATION CRITERIA

4.1 Introduction

All Phase 1 and 2 proposals will be evaluated on a competitive basis. Each Phase 1 proposal will be screened by NOAA to ensure that it meets the administrative requirements outlined in Section 4.2. Proposals that meet these requirements will be peer reviewed, undergo competition within each laboratory, and may also undergo a third round of competition across the agency.

4.2 Phase 1 Screening Criteria

To avoid misunderstanding, small businesses are cautioned that Phase 1 proposals not satisfying all the screening criteria shall be returned without peer review and will be eliminated from consideration for a contract. Proposals may not be resubmitted (with or without revision) under this solicitation. All copies of proposals that fail the screening process will be returned. The screening criteria are:

(a) The proposing firm must qualify as a small business (Section 2.1). If it is a subsidiary of another firm, this limit applies to all employees under control of the parent organization.

(b) The Phase 1 proposal must meet **all** of the requirements stated in Section 3.

(c) The Phase 1 proposal must be limited to one subtopic and clearly address research for that subtopic.

(d) **Phase 1 proposal budgets must not exceed $75,000 (except subtopics with the suffix "SG", which are limited to $50,000),** including subcontract, indirect cost, and fee.

(e) **The project duration for the Phase 1 research must not exceed 6 months.**

(f) A minimum of two-thirds of expenditures under each Phase 1 project must be carried out by the proposing firm.

(g) The proposal must contain information sufficient to be peer reviewed as research.

4.3 Phase 1 Evaluation and Selection Criteria

Phase 1 proposals will be rated by NOAA scientists or engineers with equal consideration given to the following criteria, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit of the Phase 1 research plan and its relevance to the objectives, with special emphasis on its innovativeness and originality.

(b) Importance of the problem or opportunity and anticipated benefits of the proposed research to NOAA, and the commercial potential, if successful.

(c) How well the research objectives, if achieved, establish the feasibility of the proposed concept and justify a Phase 2 effort.

(d) Qualifications of the principal investigator(s), other key staff, and consultants, and the probable adequacy of available or obtainable instrumentation and facilities.

Technical reviewers will base their ratings on information contained in the proposal. It cannot be assumed that reviewers are acquainted with any experiments referred to, key individuals, or the firm.

Final award decisions will be made by NOAA based upon ratings assigned by reviewers and consideration of additional factors, including possible duplication of other research, the importance of the proposed research as it relates to NOAA needs, and the availability of funding. NOAA may elect to fund several or none of the proposals received on a given subtopic. Upon selection of a proposal for a Phase 1 award, NOAA reserves the right to negotiate the amount of the award.

4.4 Phase 2 Evaluation and Selection Criteria

The Phase 2 proposal will undergo NOAA and external peer review for the purpose of determining overall technical or scientific merit. Review panels (one for subtopics identified as “SG”, and one for all other subtopics), composed of senior technical specialists, will make the final Phase 2 selection decision based on the written reviews and the company presentation to the panel. Each of the following evaluation criteria will receive approximately equal weight, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit with emphasis on innovation and originality.

(b) Degree to which the Phase 1 objectives were met.

(c) The commercial potential of the proposal as evidenced by: a) a record of commercialization, b) the existence of Phase 2 funding commitments from non-SBIR sources, c) existence of Phase 3 follow-on commitments, and d) the presence of other indications of commercial potential of the research.

(d) The adequacy of the Phase 2 objectives to meet the problem or opportunity.

(e) The qualifications of the principal investigator and other key personnel to carry out the proposed work.

Upon selection of a proposal for Phase 2 award, NOAA reserves the right to negotiate the amount of the award.

4.5 Release of Proposal Review Information

After final award decisions have been announced, the technical evaluations of a proposal will be provided to the proposer only upon written request and for a period not to exceed 90 days. The identity of the reviewers will not be disclosed.

5.0 CONSIDERATIONS

5.1 Awards

Contingent upon availability of funds, NOAA anticipates making about **10** Phase 1 firm-fixed-price contracts of no more than **$75,000** each (except for subtopics with the suffix "SG", which are limited to $50,000). Performance period shall be no more than 6 months beginning on the contract start date. Historically, NOAA has funded five to ten percent of the Phase 1 proposals submitted.

Phase 2 awards shall be for no more than $300,000 (except for subtopics with the suffix "SG", which are limited to $200,000). The period of performance in Phase 2 will depend upon the scope of the research, but should not exceed 24 months.

It is anticipated that **approximately one-third of the Phase 1 awardees will receive Phase 2 awards,** depending upon the availability of funds. To provide for an in-depth review of the Phase 1 final report and the Phase 2 proposal and commercialization plan, Phase 2 awards will be made approximately 7 months after the completion of Phase 1.

For planning purposes, proposers should understand that Phase 1 awards are made in July, Phase 2 proposals are due the following February, and Phase 2 awards are made during August and September.

This solicitation does not obligate NOAA to make any awards under either Phase 1 or Phase 2. Furthermore, NOAA is not responsible for any monies expended by the proposer before award of any contract or grant resulting from this solicitation.

5.2 Reports

Six copies of a final report on the Phase 1 project shall be submitted to NOAA upon completion of the Phase 1 research. The final report shall include a single-page project summary as the first page, identifying the purpose of the research, and giving a brief

description of the research carried out, the research findings or results, and the commercial applications of the research in a final paragraph. The remainder of the report should indicate in detail the research objectives, research work carried out, results obtained, and estimates of technical feasibility.

All final reports must carry an acknowledgment on the cover page such as: "This material is based upon work supported by the Department of Commerce under contract number_____. Any opinions, findings, conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the Department of Commerce."

5.3 Payment Schedule

The specific payment schedule (including payment amounts) for each contract will be incorporated into the contract upon completion of negotiations between the Government and the successful Phase 1 or Phase 2 contractor.

5.4 Proprietary Information, Inventions, and Patents

5.4.1 Limited Rights Information and Data

Information contained in unsuccessful proposals will remain the property of the proposer. Any proposal which is funded will not be made available to the public, except for the "Project Summary" page.

The inclusion of proprietary information is discouraged unless it is necessary for the proper evaluation of the proposal.

Proprietary information submitted to NOAA will be treated in confidence, to the extent permitted by law, if it is confined to a separate page or pages and marked with a legend reading:

> "Following is proprietary information which (name of proposing firm) requests not be released to persons outside the Government, except for purposes of evaluation."

Any other legend will be unacceptable to NOAA and may constitute grounds for return of the proposal without further consideration. Without assuming any liability for inadvertent disclosure, NOAA will limit dissemination of such information to its employees and, where necessary for evaluation, to outside reviewers on a confidential basis.

Since technical reports may eventually be made available to the public, such reports shall not contain any language limiting their use other than for SBIR data as described below.

5.4.2 Copyrights

The contractor may normally establish claim to copyright any written material first produced in the performance of an SBIR contract. If a claim to copyright is made, the contractor shall affix the applicable copyright notice of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including contract number) to the material when delivered to the Government, as well as when the written material or data are published or deposited for registration as a published work in the U.S. Copyright Office. For other than computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

For computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license for all such computer software to reproduce, prepare derivative works, and perform publicly and display publicly, by or on behalf of the Government.

5.4.3 Data Rights

Except for copyrighted data, the Government shall normally have unlimited rights in:

(a) data specifically identified in the SBIR contract to be delivered without restriction;

(b) form, fit, and function data delivered under the contract;

(c) data delivered under the contract that constitute manuals or instructions and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under the contract; and

(d) all other data delivered under the contract unless identified as SBIR data.

According to Federal Acquisition Regulation 52.227-20, Rights and Data - SBIR Program (March 1994), the contractor is authorized to affix the following "SBIR Rights Notice" to SBIR data delivered under the contract:

SBIR RIGHTS NOTICE

These SBIR data are furnished with SBIR rights under Contract No._____ (and subcontract_____, if appropriate). For a period of 4 years after acceptance of all items to be delivered under this contract, the Government agrees to use these data for Government purposes only, and they shall not be disclosed outside the Government (including disclosure for procurement purposes) during such period without permission of the contractor, except that, subject to the forgoing use and use by support contractors. After the aforesaid 4-year period, the Government has a royalty-free license to use, and to authorize others to use

on its behalf, these data for Government purposes, but is relieved of all disclosure prohibitions and assumes no liability for unauthorized use of these data by third parties. This Notice shall be affixed to any reproductions of these data, in whole or in part.

(END OF NOTICE)

The Government's sole obligation with respect to any properly identified SBIR data shall be as set forth in the paragraph above.

5.4.4 Patents

Small business firms normally may retain the worldwide patent rights to any invention made with NOAA support. NOAA receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must manufacture it domestically. To the extent authorized by P.L. 102-564, NOAA will not make public any information disclosing a NOAA-supported invention for a 4-year period to allow the contractor a reasonable time to pursue a patent.

5.5 Awardee Commitments

Upon the award of a contract, the contractor will be required to make certain legal commitments. The outline that follows illustrates the types of provisions that will be included in the Phase 1 contract.

(a) Standards of Work. Work performed under the contract must conform to high professional standards.

(b) Inspection of Work. Work performed under the contract is subject to Government inspection and evaluation at all reasonable times.

(c) Examination of Records. The Comptroller General (or a duly authorized representative) shall have the right to examine pertinent records of the contractor involving transactions related to this contract.

(d) Default. The Government may terminate the agreement if the contractor fails to perform the work contracted.

(e) Termination for Convenience. The contract may be terminated at any time by the Government if it deems termination to be in the best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.

(f) Disputes. Any dispute concerning the contract, which cannot be resolved by agreement, shall be decided by the Contracting Officer with right to appeal.

(g) Contract Work Hours. The contractor cannot require an employee to work more than 8 hours a day or 40 hours a week, unless the employee is compensated accordingly (i.e., receives overtime pay).

(h) Equal Opportunity. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(i) Affirmative Action for Veterans. The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran of the Vietnam era.

(j) Affirmative Action for the Handicapped. The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

(k) Officials Not to Benefit. No member of or delegate to Congress shall benefit from any SBIR contract.

(l) Covenant Against Contingent Fees. No person or agency has been employed to solicit or secure the contract upon an understanding for compensation, except bona fide employees or commercial agencies maintained by the contractor for the purpose of securing business.

(m) Gratuities. The contract may be terminated by the Government if any gratuity has been offered to any representative of the Government to secure the contract.

(n) Patent Infringement. The contractor shall report each notice or claim of patent infringement based on the performance of the contract.

(o) American-Made Equipment and Products. When purchasing either equipment or a product with funds provided through the contract, purchase only American-made equipment and products, to the extent possible in keeping with the overall research needs of the project.

5.6 Additional Information

(a) Projects--The responsibility for the performance of the principal investigator, and other employees or consultants who carry out the proposed work, lies with the management of the organization receiving an award.

(b) Organizational Information--Before award of an SBIR contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to assure responsibility of the proposer.

(c) **Duplicate Awards--If an award is made under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being, paid for essentially equivalent work by any agency of the Federal Government. Severe penalties may result from such actions.**

This program solicitation is intended for informational purposes and reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR contract, the terms of the contract are controlling.

5.7 Research Projects with Human Subjects, Human Tissue, Data or Recordings Involving Human Subjects

Any proposal that includes research involving human subjects, human tissue, data or recordings involving human subjects must meet the requirements of the Common Rule for the Protection of Human Subjects, codified for the Department of Commerce at 15 CFR Part 27. Any questions regarding these requirements should be addressed to Dr. Joseph M. Bishop (301) 713-3565 or joseph.bishop@noaa.gov.

5.8 Research Projects Involving Vertebrate Animals

Any proposal that includes research involving vertebrate animals (including fish) must be in compliance with the National Research Council's "Guide for the Care and Use of Laboratory Animals" which can be obtained from National Academy Press, 2101 Constitution Avenue, NW, Washington, D.C. 20055. In addition, such proposals must meet the requirements of the Animal Welfare Act (7 U.S.C. 2131 et seq.), 9 CFR Parts 1, 2, and 3, and if appropriate, 21 CFR Part 58. These regulations do not apply to proposed research using pre-existing images of animals or to research plans that **do not** include live animals that are being cared for, euthanased, or used by the project participants to accomplish research goals, teaching, or testing. These regulations also do not apply to obtaining animal materials from commercial processors of animal products or to animal cell lines or tissues from tissue banks.

6.0 SUBMISSION OF PROPOSALS

6.1 Deadline for Proposals

Deadline for Phase 1 proposal receipt (6 copies) at the Contract Administration Branch is noon on January 17, 2001.

NOAA assumes no responsibility for evaluating proposals received after the stated deadline or that do not adhere to the other requirements of this solicitation (see checklist at back of booklet). Such proposals may be returned to the proposer without review.

Federal Acquisition Regulation (FAR 52 215-1) regarding late proposals shall apply.

Letters of instruction will be sent to those eligible to submit Phase 2 proposals. The Phase 2 proposals are due at about the same time as Phase 1 final reports - 7 months after commencement of the Phase 1 contract.

Proposers are cautioned to be careful of unforeseen delays which can cause late arrival of proposals at NOAA, resulting in them not being included in the evaluation procedures. No information on the status of proposals under scientific/technical evaluation will be available until formal notification is made.

6.2 Proposal Submission

Hardcopy submission of NOAA proposals should be sent in 6 copies to:

ATTN: SBIR Proposals
U.S. Department of Commerce, NOAA
Contract Administration Branch, Code OFA613
1305 East-West Highway, SSMC4, Station 7604
Silver Spring, MD 20910
Telephone: (301) 713-0829

For local delivery, the Contract Administration Branch is located near the intersection of East-West Highway and Colesville Road, and close to the Silver Spring Metro stop.

Acknowledgment of receipt of a proposal by NOAA will be made. All correspondence relating to proposals must cite the specific **proposal number** identified on the acknowledgment.

(a) **Packaging--Secure packaging is mandatory. NOAA cannot process proposals damaged in transit. All 6 copies of the proposal must be sent in the same package. Do not send separate "information copies," or several packages containing parts of a single proposal, or two packages of 6 copies of the same proposal. The top copy must be signed as an original by the principal investigator and the corporate official. Other copies may be photocopies.**

(b) Bindings--**Do not use special bindings or covers.** Staple the pages in the upper left hand corner of each proposal. Separation or loss of proposal pages cannot be the responsibility of NOAA.

6.3 Warning

While it is permissible, with proper notification to NOAA, to submit identical or essentially equivalent proposals for consideration under numerous Federal program solicitations, it is unlawful to enter into contracts requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

7.0 SCIENTIFIC AND TECHNICAL INFORMATION ASSISTANCE

7.1 General Information

The following organizations may be sources for providing technology search and/or document services and may be contacted directly:

NOAA Library
1315 East-West Highway
Second Floor, SSMC3
Silver Spring, MD 20910
(301) 713-2600

7.2 Oceanography and Marine Science

Scientific information in the areas of oceanography and marine science may be obtained from the following organizations:

University of Alaska
P.O. Box 755040
Fairbanks, AK 99775
907/474-7086

University of California-San Diego
9500 Gilman Drive
LaJolla, CA 92093
619/534-4440

Hancock Institute for Marine Studies
University Park
Los Angeles, CA 90089
213/740-1961

University of Connecticut
1084 Shennecossett Road
Groton, CT 06340
203/445-3457

University of Delaware
Robinson Hall, Rm 111
Newark, DE 19716
302/831-2841

University of Florida
Building 803
Gainesville, FL 32611
904/392-5870

University of Georgia
Ecology Building
Athens, GA 30602
706/542-6009

University of Hawaii
1000 Pope Road, Rm. 223
Honolulu, HI 96822
808/956-7031

University of Illinois
65 Mumford Hall
1301 W. Gregory Drive
Urbana, IL 61801
217/333-9448

Purdue University
1159 Forestry Building
W. Lafayette, IN 47907
317/494-3573

Louisiana State University
128 Wetland Resources
Baton Rouge, LA 70803
504/388-6710

University of Maine
14 Coburn Hall
Orono, ME 04469- 0114
207/581-1436

University of Maryland
0112 Skinner Hall
College Park, MD 20742
301/405-6371

Massachusetts Institute of Technology
Bldg. E38, Room 330
77 Massachusetts Avenue
Cambridge, MA 02139
617/253-7131

Woods Hole Oceanographic Inst.
CRL 209
Woods Hole, MA 02543
508/457-2000 ext. 2665

University of Michigan
4107 I.S.T. Building
2200 Bonisteel Blvd.
Ann Arbor, MI 48109
313/763-1437

University of Minnesota
2305 East 5th Street
Duluth, MN 55812
218/726-8106

MS-AL Sea Grant Consortium
P.O. Box 7000
703 East Beach Drive
Ocean Springs, MS 39564
601/875-9341

University of New Hampshire
Ocean Process Analysis Lab.
142 Morse Hall
Durham, NH 03824
603/862-3505

NJ Marine Sciences Consortium
Building No. 22
Ft. Hancock, NJ 07732
908/872-1300

State University of New York
115 Nassau Hall
Stony Brook, NY 11794
516/632-6905

North Carolina State University
Box 8605
Raleigh, NC 27695
919/515-1454

Ohio State University
1541 Research Center
1314 Kinnear Road
Columbus, OH 43212
614/292-8949

Oregon State University
Administrative Services
Corvallis, OR 97331
503/737-3396

University of Puerto Rico
Dept. of Marine Science
P.O. Box 5000
Mayaguez, PR 00681
809/832-3585

University of Rhode Island
Marine Resources Bldg.
Narragansett Bay Campus
Narragansett, RI 02882
401/792-6800

South Carolina Sea Grant Consortium
287 Meeting Street
Charleston, SC 29401
803/727-2078

Texas A&M University
1716 Briarcrest Drive
Suite 702
Bryan, TX 77802
409/845-3854

Virginia Graduate Marine Science Consortium
Madison House 170
Rugby Road
Charlottesville, VA 22903
804/924-5965

University of Washington
HG-30
3716 Brooklyn Ave, N.E.
Seattle, WA 98105-6716
206/543-6600

University of WI-Madison
1800 University Avenue
Madison, WI 53705
608/262-0905

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8.0 TECHNICAL TOPICS

The subtopics in sections 8.1 through 8.5 are from the National Oceanic and Atmospheric Administration (NOAA). Approximately 10 awards will be made on these subtopics.

8.1 NOAA TOPIC: ATMOSPHERIC SCIENCES

8.1.1R SUBTOPIC: Long-Lived, Vertically Controllable, Superpressure Balloon Vehicle for Deployment of In-situ Environmental Sensors

Measurements of meteorological, atmospheric chemistry, and oceanic parameters in regions that are presently unmonitored or difficult-to-monitor could aid in scientific understanding of critical processes. These include the development of weather systems approaching the coast and the impacts of these systems on 2- to 5-day forecasts; the effects on agriculture of regional climate changes; the identification of sources and sinks of greenhouses gases; and changes in the temperature, strength and location of ocean currents. These measurements could also provide data to aid national policy decisions on critical environmental issues. This need is to develop a balloon vehicle and hardware to provide the capabilities needed for the environmental in-situ monitoring program described in Girz et al. (1999). The required capabilities are: (1) to float in the lower stratosphere (18 km and higher) for 12 months, (2) to be vertically controllable by increasing and releasing pressure, (3) to carry a gondola for a 225-kg payload of control and environmental instruments, (4) to be terminated by two independent methods, and (5) to descend at $\leq$ 600 fpm after termination. The balloon will interface with additional hardware and electronic systems for command, control, communications and power that will be developed independently. The balloon must meet aviation-safety requirements during launch, at float altitude, and during descent. Recoverability and reuse of the balloon is desirable. Production and maintenance of a multi-balloon network is anticipated. The balloon also has potential for remote sensing and communications applications.

Reference: Girz, C.M.I.R., A.E. MacDonald, R.L. Anderson, T. Lachenmeier, F. Caracena and R. Collander, "Global Air-ocean IN-situ System (GAINS)", Collection of Technical Papers, 13th Lighter-Than-Air Systems Technology Conference and AIAA International Balloon Technology Conference, Norfolk, 1999.

8.1.2R Subtopic: Robust, Precise CO2 Analyzer for Unattended Field Use

Carbon dioxide is by far the most important of the manmade gases likely to cause significant global climate change in the 21st century and beyond. The Kyoto protocol in 1998 was the first step toward an international agreement limiting the emissions of CO2 and fostering its sequestration on land or in the oceans. Because of rapid mixing in the atmosphere precise measurements of CO2 in air are currently the only way to track and quantify the global carbon cycle on very large spatial scales (Fan, 1998; Tans, 1990). Needed are large numbers of continuous CO2 gas analyzers with the following specifications: 1. Ability to determine the mole fraction of CO2 in dry ambient air to a precision of 1 part in 3000 or better in 1 minute or less; 2.

Very low gas use (30 cc/min or less) to minimize problems due to water vapor and to minimize consumption of reference gases, if employed; 3. Robust enough to deploy unattended in the field for periods of half a year or longer; 4. Cost five thousand dollars maximum when manufactured in quantity. A differential gas analyzer design is acceptable. The instrument is not sensitive to motion.

References: Fan et al., A large terrestrial sink in North America implied by atmospheric and oceanic carbon dioxide data and models, Science 282, 442-446, 1998.

Tans et al., Observational constraints on the global atmospheric carbon dioxide budget, Science 247, 1431-1438, 1990.

8.1.3R Subtopic: Laser for an Unattended Atmospheric Water Vapor Profiler

The NOAA Environmental Technology Laboratory is currently building a compact, low-cost and eye-safe DIfferential Absorption Lidar (DIAL) to measure water vapor profiles in the lower troposphere with moderate spatial and temporal resolution. A low-cost, low-maintenance lidar system is desirable because it permits affordable unattended deployment of multiple lidars for regional studies of moisture transport. Such measurements are needed for the improvement of weather forecast and climate models, where first order improvements in both the quality and the quantity of atmospheric water vapor measurements will be necessary. The current lidar transmitter uses a diode laser amplified with a high pulse repetition frequency (prf) tapered amplifier with a maximum peak power output of 500 mW (average power of 2 mW at 10 kHz). Water vapor measurements with greatly improved time resolution and signal-to-noise ratio could be obtained with a 10x higher power laser. Proposals are requested for a compact infrared solid state laser for the DIAL transmitter with the following capabilities. The laser should have a prf of 6-10 kHz, pulse durations of 20 to 400 ns, no pre/post-pulse light, and a TEM00 mode. The laser should have good efficiency, stability and no change in beam-pointing when the wavelength is tuned. The laser should also be rugged with a projected commercial cost of less than about $40,000. For DIAL, it is essential that the laser can be locked to specific wavelength with single frequency operation (a linewidth of less than several hundred kHz). For water vapor DIAL, the laser should be quickly tunable on and off one or more good water vapor lines in one of the following wavelength regions: 716-735 nm, 692-703 nm, 811-837 (especially near 825) nm, or 892-986 (especially near 940) nm. This laser would have commercial prospects for spectroscopy, remote sensing, medical applications (e.g. photodynamic therapy and surgery), and applications in ultrasensitive detection.

8.1.4R Subtopic: Bistatic Remote Sensing of the Ocean Surface Wind Vector Using Forward Scattered GPS Signals

The ocean surface wind vector is an important environmental parameter for research and operational marine forecasting. Investigators over the last several years have shown that it is possible to measure the ocean surface wind speed using forward scattered GPS signals. This technique includes airborne Delay Mapping Receivers (DMR), developed at NASA, which is able to detect range-coded GPS signals scattered from ocean surface roughness. However, their ability to measure wind direction is marginal. The main deficiency of existing DMR lies in the ability to analyze only a limited range of effects because data collection requires the pre-selection of frequency, polarization, predetermined spatial resolution and a

fixed Doppler shift compensation. The correlation processing is performed in real-time; thus for any experimental trial only one signal processing strategy is available. The Environmental Technology Laboratory (ETL) is seeking to develop a delay-Doppler mapping receiver with a high degree of flexibility, providing as much information as possible on the reflected signal waveform. The receiver should have an ability to perform both a conventional correlation processing in real-time (with an adaptable spatial resolution) for an assessment of the environmental situation, and a raw-data recording of the GPS reflected signal. The complete system should include also a software correlator for the post-test processing. Such a system should enable a variety of processing techniques to be tested on the same data set. The ETL is interested in a low-cost, small-package, airborne (10 km maximal altitude for airplane, and 40 km maximal altitude for balloons) instrument. Equipment configurations to enhance observability of surface wind vector should also be considered. The system should have an ability to employ multiple-antenna polarization-diverse interferometry.

8.1.5R Subtopic: Unattended IR Radiometer for Climate Studies

The Environmental Technology Laboratory's ground-based remote sensors are now being used in combination to observe cloud properties. For example, Ka-band cloud radar and IR radiometers are used together to measure ice particle characteristic sizes and ice mixing ratios in cirrus clouds. Unfortunately, most IR radiometers in use today are either much more sophisticated, and therefore more expensive, than necessary for this task, e.g., the high spectral resolution FTIR instrument, or they are too primitive and do not have the ability to accurately measure the low temperatures associated with clouds and clear sky conditions. What is needed is an inexpensive IR radiometer with the following capabilities: it should be able to measure downwelling radiances corresponding to IR brightness temperatures between 150 and 300 K with a 2 K accuracy within the 10.8 to 11.2 micron band over a 2 deg field of view with temporal resolution on the order of 1 minute or less. It should be simple, easy to maintain, e.g., not require liquid nitrogen coolant, and should be capable of running unattended in harsh outdoor environments. Simple but accurate calibration procedures are another essential element. There is a growing need for such an instrument since the number of cloud radars being built for climate studies related to global warming is expanding rapidly. An inexpensive but accurate IR radiometer addition to these radar systems would enhance their utility.

8.1.6W Subtopic: Observing Stations Meta Data System

Civilian and government field offices collect and provide site physical information (referred to as meta data) for a large variety of stations providing weather observations. These stations provide aviation, mesonets, climate, upper air, radar and other types of weather observations. The station meta data is currently provided through a variety of methods from computer interface to paper. There is a need to standardize the collection and automate the methods through which the meta data is collected and managed. A research innovation and algorithms that are components of an automated system are needed to ensure station meta data can be readily entered into a computer and transmitted to users in a timely manner. The goals of the new meta data system are:

1. Be the authoritative source for all civilian weather observing station meta data.

2. Provide centralized Web based software and hardware which will support the field operations in providing timely and accurate meta data. Field offices should be able to enter data in a user friendly environment including extensive entry level quality control. The modernized Cooperative observing network meta data system being developed internally by the NWS should serve as a model for framing a new meta data system.

3. Provide timely station meta data to the National Climatic Data Center for archival and dissemination to customers.

The initiative should use web based technology, dedicated Internet servers and provide tools such as digital cameras to the NWS field locations for providing enhanced station meta data. This development will be imbedded in the NWS Cooperative Observing program modernization activities.

POC: William Fellows National Weather Service, Office of Systems Development Tel:301-713-0305 x 132

8.1.7W Subtopic: Monitoring of Cloud Boundaries and Characteristics

The NWS has a need for the continual monitoring of cloud bases and tops at all levels of the atmosphere from the surface to 60,000 ft. The desired instrument should be able to penetrate multiple cloud layers including thick overcast clouds. It should be able to operate in all weather conditions including precipitation. The desired accuracy of cloud detection is within 100 ft for the first 3000 ft above ground, and 1000 ft or better up to 60,000 ft. It is anticipated that mm radar technology would be required to determine these cloud layers. Other technologies that could perform this function can be addressed in the response. An additional desired feature of the cloud detection instrument would be the ability to distinguish ice from water clouds, and to distinguish drop size distributions within the cloud layers. A second need to be addressed in the response is a way to continually monitor the depth of the atmosphere boundary layer in addition to monitoring the height of the cloud layers from the ceilometer. A third need is a way to continually monitor the vertical distribution of moisture between the surface and 30,000 ft.

POC: William Fellows, NWS, Office of Systems Development, Tel: 301-713-0305 x 132

8.1.8W Subtopic: Tornado Path Prediction and Optimal Detection Methods

In recent years, techniques and technologies to detect the occurrence of tornadoes have been developed. This includes R&D into systems that have used acoustic signatures, seismic waves, and Doppler radars and lasers. Also, various tornado data bases and computer based systems have been being investigated and developed. The ability to identify and predict potential/probable tornado paths would address natural terrain, boundaries, rivers, bodies of water, hills, and other geographic features is required. A computer based analysis and processing capability would be developed, with interactive graphics, displays, menus, and product files. Also, the capability and programs for determining and simulating optimal placement of tornado detection sensors for various areas should be addressed. Climate and seasonal aspects of tornado occurrence for given areas should be considered and developed. Algorithms, data bases, analysis tools, the types of computers and systems are to be recommended and defined. The products, processing, and displays should include optimization models, knowledge based expert systems, graphical types of outputs, and predictive path and detection strategies for

tornadoes relative to the natural terrain and zones. Any novel technique for detection and prediction of tornadoes can be included. Innovative methods for addressing tornado-prone areas in the United States can be described.

POC: William G. Fellows, NWS, Office of Systems Development, Tel:301-713-0305 x 132

8.2 NOAA TOPIC: OCEAN OBSERVATION SYSTEMS

8.2.1O Subtopic: Operational Ocean Instrumentation, Measurement, and Data/Information Dissemination Systems

Development of operational ocean instrumentation, measurement, and data/information dissemination systems is sought to support a wide range of NOAA's National Ocean Service (NOS) operational activities, such as the Physical Oceanographic Real-Time System (PORTS) Program, the National Water Level Observation Network (NWLON), coastal and estuarine forecast systems, and environmental monitoring associated with sustaining healthy coasts. Development generally includes sensing, data acquisition, and information dissemination. One area of emphasis is systems that can be operated in an unattended mode. These systems should provide near real-time data acquisition and dissemination. Another area of emphasis is remote sensing systems which allow rapid acquisition of data from large coastal areas. High reliability, known accuracy, and cost effectiveness are important design considerations. The parameters of interest are comprehensive, including (1) physical, chemical, and biological properties of the coastal ocean environment; (2) pollutants; and (3) overlying atmospheric parameters. These systems provide marine environmental information in support of safe navigation, safe transportation of hazardous materials, economic benefits to marine commerce, management of marine resources, and assessment of coastal ecosystems health.

Of particular interest this year are proposals relative to the following:

a.) Long-Term and Real-Time Water Quality Monitoring System - Water quality in estuarine waters, such as bays and harbors, is important to coastal ecological health, recreation, and commerce. A reliable, in-situ system that can measure dissolved oxygen, and /or chlorophyll is sought. Features such as an unattended long service interval (3-month or longer) and real-time reporting (interval of 1-hour or less) are essential. Solutions to technical problems associated with marine fouling and corrosion should be emphasized. The technology is a candidate for integration with NOS PORTS or NWLON installations.

b.) Airborne Spectrofluorometer for Coastal Mapping - NOAA is soliciting for a small-aircraft mountable airborne spectrofluorometer system to enable the mapping of photosynthetic pigment containing marine organisms, such as zooxanthellae, phytoplankton and submerged aquatic vegetation. This instrument will enable the assessment of such applications as coral reef health, phytoplankton concentrations, and submerged aquatic vegetation set forth in the critical strategic plan. An airborne spectrofluorometer will have a great commercial potential for cross-cutting oceanographic and fishery applications as well as many other terrestrial applications. Spectral issues to be considered are the typical excitation wavelengths for chlorophyll of about 532 and 337 nm, with emission wavelengths of about 685 nm and 740 nm. The red region of the electromagnetic spectrum is greatly attenuated by the water column and thus an innovative approach is needed in optoelectronics. To assist in the differentiation of plant

types, as well as some dissolved organic material, a programmable range of excitation wavelength and a scanned emission wavelength range should be incorporated into the instrument. An imaging, synoptic system is required for the strategic mapping plan and thus such systems as a scanner or an array system is required. Spatial considerations are that a data stabilized platform is required, such as one that incorporates an inertial measurement unit (IMU). NOAA is seeking innovation which enables deployment from small aircraft, as well as large aircraft, flying between 100-200 knots and with GPS navigation of one part per thousand. Hoge (1. Instrumentation) described an instrument that has many of the criterion and applications (Hoge, 2. Applications) that NOAA is seeking. Software considerations include: 1) programmable excitation wavelength and scanned emission wavelengths in very narrow wavelength bands; 2) the system will need to collect large data volumes; 3) process and display raw data in flight; 4) post-process to a radiometric calibrated/corrected, and rectified data set; and 5) a format that can be utilized by off the shelf image processing software, such as ENVI or Imagine.

References: Hoge, F.E., R.E. Berry, and R.N. Swift. "Active-passive Airborne Ocean Color Measurement. 1: Instrumentation." Applied Optics: vol. 25, no.1 p39-47, 1986.

Hoge, F.E., R.N. Swift, and J.K. Yungel. "Active-passive Airborne Ocean Color Measurement. 2: Applications." Applied Optics: vol. 25, no.1 p. 48-57,1986.

c). Digital Camera Visibility Sensor - A digital camera visibility sensor similar to that of human observation is sought. Typical visibility sensors determine the scattering properties within a relatively small air volume, and then use a transfer algorithm to convert that observation into a distance measurement equivalent to that which a human observer would report. While achieving an objective measurement, differences exist between the two observation techniques. A good, brief description of the limitations of an automated visibility sensor when compared to human observations can be found at http://www.nws.noaa.gov/asos/vsby.htm. Visual images are now routinely used for automobile traffic reports and vessel traffic management. The images are satisfactory for subjective determination of visibility, but this solicitation seeks a method to quantify the observation. Images and descriptions with quantitative scales of the quality of visual targets at known distances will be disseminated to users in real-time. An example is a maritime application in the vicinity of bridges, which can represent a significant hazard to navigation in limited visibility situations. The system would provide an image and the quantitative visual description of bridge support pilings, bridge deck lamp posts, range markers, navigation lights, and other visual targets. The system shall be weatherproof and operate unattended under all weather conditions. It should operate at 12 VDC with a sleep mode. Minimal data update interval is 6-minute. Sensor output should be able to interface with commercial data communication devices such as RS-232 ports, telephone, wireless phone, line-of-sight radio, and over the Internet.

8.2.2GP Subtopic: Autonomous Analyzers for Measurement of Air-Sea CO2 Fluxes

To improve the global data base of air-sea CO2 fluxes, autonomous low-cost sensors are necessary to measure partial pressure differences of CO2 between water and air (pCO2), in combination with measurements of the physical forcing to determine air-sea CO_2 flux. In this context, development of pCO2 sensors that can be integrated with devices that measure surface gas transfer proxies mounted on a variety of platforms with telemetering capabilities is encouraged. Proposals are sought for the development of an autonomous pCO2 sensor. Performance specifications for the pCO2 sensor include measurement of pCO2 to better

than 3 µatm with at least hourly frequency, sensor longevity of 6-months or more, internal calibration, remote transmission of data, and low cost such that disposable use can be considered. A measure of pCO2 is critical to provide estimates of air-sea CO2 fluxes on regional to global scales. A successful autonomous pCO2 sensor would likely be coupled with measurement of surface gas transfer proxies and incorporated into established global ocean observing system platforms such as free-drifting or fixed instrumented buoys, (subsurface) floats, and ships of opportunity.

8.2.3R Subtopic: Electronic Arrays for Marine Chemical Sensing and Identification

The purpose of this research is to develop a prototype marine instrument deployable on a towed or profiling platform capable of providing chemical compound identification and quantification. Identifying and quantifying the chemical compounds that make up marine nutrients and contaminants currently requires time consuming and costly field sample collection and laboratory analyses. Technologies such as quartz crystal microbalance, surface acoustic-wave, and MOSFETs, currently being developed for chemical compound detection in air (Nagle et al. 1998), can be applied in the marine environment to allow direct extraction of data in the field or to provide survey information during field sampling efforts. These technologies do not employ colorimetric measurement requiring chemical reagents. Instrumentation utilizing this technology will be applicable to marine environmental research, environmental monitoring and municipal drinking water quality assessment. Detection specifications for contaminants and nutrients of interest:

	Range	Resolution
Persistent Organic Contaminants	0-1 ppm	1 ppt
Phosphate	0.5-3.0 ug P/L	0.1 ug P/L
Silica	0.1-2.0 mg SiO2/L	0.1 mg SiO2/L
Dissolved Oxygen	0-12 mg/L	0.01 mg/L
Nitrate-nitrogen (NO3)	0.01 - .5 mg N/L	0.01 mg N/L
Ammonium-nitrogen (NH4)	5 - 50 ug N/L	1.0 ug N/L
Alkaline Phosphatase	TBD	TBD

Reference: Nagle, H.T. and Schiffman, S.S., The How and Why of Electronic Noses, Institute for Electrical and Electronics Engineers *Spectrum*, September 1998, pp. 22-34.

8.2.4S Subtopic Calibration of Ocean Satellite Observations

In situ measurements of oceanographic parameters are needed to calibrate/validate remotely senced satellite data and to improve operational algorithms. The requirement is to develop a instrument system rugged enough to withstand winds up to 50 knots and the accompanying waves. The system could be mounted to a fixed frame or attached to a tethered buoy.In priority order the measurements are:
GPS Position
Observation time
Sea surface temperature(1 M depth/1 hr average)
Solar insolation(surface/1 hr average)
Ph,oxygen,& alkality(1 M depth/several times per day)
Current velocity(hourly average)
Nitrate(1 M depth/every 4 to 6 hrs)
Water depth(every 6 hrs for drifting buoy)
Measurements of lesser importance:

Chlorophyll/turbidity/particle count(1 M depth)
pCO2 (1 M depth/daily or hourly averages)
Salinity (1 M depth/daily or hourly averages)

8.3 NOAA TOPIC: LIVING MARINE RESOURCES

8.3.1R Subtopic Development of Gear Technology to Improve Stock Assessments, Reduce By-Catch, and Exclude Marine Mammals

One of the significant and often controversial problems in marine fisheries involves the selectivity of gear related to the increased mortality of non-target species and size classes. The by-catch that results from nonselective gear often includes important recreational, commercial, or endangered species. The innovation requested requires the development of better by-catch reduction devices, improved fishing methods (including more species-selective and size-selective fishing gear and improved at-sea techniques), and better on-board processing methods to reduce discard mortality. Solutions may include developing a better understanding of the use of different mesh sizes in trawling or as technologically complex as developing better by-catch reduction devices.

8.3.2F Subtopic: Shrimp Virus Disinfection Techniques for Aquaculture and Processing Wastes/Effluent

The objective is to develop large scale low cost virus disinfection treatments for shrimp waste products in aquaculture and processing facilities. The research should be based on laboratory studies on scale disinfection treatments already developed.
References: Chang,et al. “The Effect of Ultraviolet Irradiation, Heat, pH, Ozone, Salinity, and Chemical Disinfectants on the Infectivity of White Spot Syndrome Baculovirus. Aquaculture,” 166: 1-17.and 2, 1998.
Nakano, H., et al. “Inactivation of Penaeid Rod-shaped DNA Virus (PRDV), the Causative Agent of Penaeid Acute Viremia (PAV),” by Some Chemical and Physical Treatments. Fish Pathology 33(2): 65-71, 1998.

8.4 NOAA TOPIC: OCEAN SCIENCE

8.4.1SG Subtopic: Aquaculture: Developing and Improving Species Culture

Proposals are requested for research which offers to make significant, industry-wide improvements in finfish, shellfish, and ornamental fish culture systems for both small scale and large scale applications. Priority will be given to research which finds innovative approaches that will solve major industry bottlenecks in an economically and environmentally compatible manner. Research aimed at new species for culture and research to adapt techniques being used successfully in other countries are appropriate.

8.4.2SG Subtopic: Aquaculture: Water Reuse and Effluent Treatment Systems

Proposals are requested for developing integrated aquaculture systems with minimum impact on the environment. These include development of innovative water reuse systems for

ponds and raceways and other novel systems for treating effluent. Special priority will be given to prototype, modular water reuse systems suitable for producing a variety of species anywhere in the United States.

8.4.3SG Subtopic: Aquaculture of Marine Organisms for Marine Natural Products

Research in the past two decades has found that there are many marine organisms which produce novel natural products of use in treating human diseases. To utilize these products commercially and in clinical trial, however, they need either to be chemically synthesized, produced using biotechnology, or produced through aquaculture of the organism. Research is needed to find economically cost-effective and biologically viable ways to culture marine organisms specifically for their production of novel natural products.

8.4.4SG Subtopic: Open-Ocean Aquaculture Systems

Both engineering and biological technology needs to be explored for the development of open-ocean or offshore culture systems. Large scale, offshore, submersible and floating systems need to be developed for Atlantic, Gulf of Mexico and Pacific conditions. Automation of feeding and harvesting functions as well as telemetry and remote control systems will be considered in this competition. The biological technology would include hatchery, nursery and transport systems for candidate species for open ocean-aquaculture. Field tests of candidate species are encouraged.

8.4.5SG Subtopic: Disease Diagnostics and Controls

Given the severe problems with aquaculture disease diagnostics and controls, we seek proposals in those areas in order to reduce the impacts on the US aquaculture industry.

8.4.6SG Subtopic: Aquaculture Industry Engineering

NOAA, in keeping with DOC Aquaculture Policy, is seeking proposals related to aquaculture engineering and equipment to support the industry. Specifically for this call, we are looking for improved designs for underwater feeders, shrimp de-heading devices, large scale production systems, and harvesting devices.

8.4.7SG Subtopic: Development of Computer Simulation Models for Sediment Transport for Port and Harbor Applications

As a consequence of increased understanding of hydrodynamic phenomena and the widespread availability of sophisticated graphical software and high speed computing facilities, the systematic study and reliable prediction of hydrodynamic conditions in harbors is now possible. Studies pertaining to many of these conditions were, until now, beset by oversimplification. It is now possible, for instance to develop sophisticated, practical, and reliable wave prediction models for harbor applications that include realistic physics and boundary conditions. This initiative seeks to provide greater understanding and new models for many harbor-related phenomena. While stringent environmental laws inhibit the introduction of contaminated material on the seabed, waves induced by local wind or by

boat traffic can resuspend (the frequently contaminated) sediments on the seabed. This influences the dispersal of settled material, including mounds of dredged material or other material from past deposits. Resuspension and transport of fine suspensions is hence of immense importance to both the maintenance of navigation channels and to the environmental water quality. NOAA is interested in developing models for predicting their dispersal (by waves and currents induced by winds and tides), for all harbors, and assess the potential environmental consequences of sediment transport and redistribution resulting from port improvements.

8.4.8SG Subtopic: Develop Computer Models/Simulations to Estimate Vessel Hydrodynamics

Ship hydrodynamics in channels, restricted waters and in the presence of other ships: Ship-induced disturbances lead to high cost for maintaining and repairing the sea walls and/or beaches, and small coastal structures, in addition to mobilizing sediments on the seabed. Regulating and scheduling shipping and ferry traffic require quantitative modeling of sea states generated by this traffic. NOAA is interested in developing new theories and computational models for multiple moored ships in harbors and the transient responses of moving ships on one another. The models can be used to predict the effects on banks and shores in order to guide designs for wave absorbers, reflectors, etc.

8.4.9SG Subtopic: Develop Models for Improving Vessel Navigation Within Ports and Harbors

The likelihood of collisions between ships and fixed structures or other ships varies greatly with the geometry of the obstacle and the waterway, the type of maneuver, the characteristics of the vessel, the experience of the captain, the traffic density, and environmental conditions such as visibility, currents and waves. New theories and methods to study the safety of harbors from a system perspective need to be developed. These include models producing synthetic ship trajectories and new generation ship motion simulators which can integrate data associated with ship type, channel bottom/side topography, environmental (wind and current) input, and navigational and human factors in order to produce appropriate tracks as the ships transit through a channel or waterway.

8.4.10SG Subtopic: Develop Computer Models/Simulation for Economic Design of Navigation Channels

For a given density of vessel traffic, the design process navigation channels involves minimizing construction and maintenance costs and the cost associated with expected casualties. These are dependent on various design and operating parameters (e.g. channel geometry, configuration of turns, vessel escort requirements and navigation aids, etc). The design process is often hindered by the fact that great uncertainty accompanies these costs. The development of new methods, including probabilistic methods based on based on synthesizing existing data, is needed. The goal is to develop new tools for improved estimation of project costs, including initial construction and future maintenance (as a function of channel dimensions, type of material, silting rates, etc.), casualty costs, and costs pertaining to natural resource damage.

8.5 NOAA TOPICS: CARTOGRAPHY, PHOTOGRAMMETRY, HYDROGRAPHY, and GEODESY

8.5.1O Subtopic: Cartographic Data and Geographic Information Systems (GIS)

Innovations with commercial potential are sought incorporating new and emerging technologies related to digital cartographic imaging and GIS systems to support National Ocean Service (NOS) requirements. The NOS makes its products, data, and metadata available to agencies, academia and the public through electronic access via computer networks. Needed research critical to the NOS mission includes:

a) New methods for generation, update, and transfer of geo-data products and data files from spatial data bases, including raster images, to meet emerging requirements of Electronic Chart Display and Information System (ECDIS) and similar shipboard electronic navigation systems using raster displays.

b) User-transparent approaches to geo-data and geo-processing interoperability across networks (e.g., the Internet), for: Software Interoperability: Automatically invoked platform independent processing functions; and Data Interoperability: User-transparent autonomous standard file format conversions.

c) Innovations for easily locating, accessing, searching, transferring, reformatting, and portraying geo-data and GIS graphic products across networks. These could involve knowledge processing via expert systems and/or neural nets, hyper-links (e.g., Netscape-like), geospatial search engines, or improved conventional techniques.

d) New methods for enhancing/compressing raster images of nautical chart features, including text and feature symbology. These can range from conventional image processing and optical character recognition algorithms to the use of expert systems, fuzzy logic, neural nets, and specialized pattern recognition/matching algorithms.

e) Improved methods for error-free raster-to-vector and vector-to-raster conversion/compression for digital raster images, including semi-automated GIS data attribution and metadata generation directly from the vectorized raster data files.

f) Heads-up raster and vector navigation and nautical charting display systems. Such systems could show data in 2 and 3 dimensional displays for mariners. Such practical information could be shown on (semi-)transparent, portable, heads-up displays superimposed in novel ways on the actual environment to help mariners navigate, especially in conditions of limited visibility.

g) A comprehensive method for remote, real-time monitoring and display of navigation channel depths to within 1 foot and widths to within 10 feet throughout the entire channel length (1 mile to 100 miles). The method must be comparable in cost to the periodic sonar surveys currently in use. A “survey” by this method should not take more than 24 hours, if possible.

8.5.2O Subtopic: Hydrographic Data Acquisition and Data Processing

The National Ocean Service is seeking to improve the efficiency and effectiveness of its hydrographic operations. This request is for the development of software and algorithm solutions to problems of data acquisition and data processing. This does not, however, preclude solutions that are primarily hardware in nature. Of particular interest are: a) the blending of bathymetric data and acoustic imagery; b) improved data editing techniques which utilize both the acoustic backscatter strength and slant range time of flight on the several beams of a multibeam bathymetric sonar; c) efficient 3-D visualization of large fields

of spatial data; and d) online tools for assessing/assigning quality parameters to bathymetric data as a function of nadir angle and natural variability of the local bathymetry.

8.5.3O Subtopic: Airborne Gravity Measurement System

Airborne gravity provides better coverage and faster and more complete data acquisition than land-based measurements. This is especially important in coastal regions where gravity knowledge is limited due to the lack of airborne instrumentation. Airborne gravimetry also makes is possible to map harsh and rugged terrain that is difficult to access on the ground. There is also a great potential commercial benefit for the oil/gas exploration market. Currently airborne gravity measurements are limited to spring-type instruments that suffer severe problems of drift, calibration, and tares. These disadvantages can be overcome. By combining land-based absolute gravity technology together with an increased ability to measure aircraft accelerations using Global Positioning System (GPS), this becomes an attractive instrument development track.

8.5.4O Subtopic: GPS-Tracked Buoy for Hydrographic Survey Applications

An instrumented buoy is sought to support NOAA hydrographic survey and other missions in estuarine and coastal waters. The buoy shall be able to measure mean surface water level heights using precision GPS to an accuracy of within 5 cm in a DGPS mode. Horizontal excursion of the buoy shall be within 50 meters. The buoy and GPS antenna motions induced by surface waves should be properly compensated and corrected and sampling rate should be adequate to obtain true mean surface water level heights. Other ancillary sensors, if necessary, could be installed. However, their impacts on system reliability, power consumption, and data volume should be addressed. Averaged water level heights are typically recorded at 6-minute intervals. The buoy data measuring system shall be self-contained and operated up to 3 months in moderate sea states. Remote access of data from buoy via line-of-sight radio at convenient time intervals is desired. The buoy system shall be deployable from a small vessel (say 10 m length).

Proposal to Department of Commerce
COVER PAGE

PROGRAM NOAA/SBIR - SMALL BUSINESS INNOVATION RESEARCH	This firm and/or Principal Investigator ___ has ___ has not submitted proposals for essentially equivalent work under other federal program solicitations, or ___ has ___ has not received other federal awards for essentially equivalent work.
SOLICITATION NO.: NOAA 2001-1	CLOSING DATE January 17, 2001
NAME OF SUBMITTING FIRM	
ADDRESS OF FIRM (INCLUDING SIP CODE + 4)	
TITLE OF PROPOSED PROJECT	
REQUESTED AMOUNT $	PROPOSED DURATION 6 months
SOLICITATION SUBTOPIC NO.	SOLICITATION SUBTOPIC TITLE

THE ABOVE ORGANIZATION CERTIFIES THAT:	YES	NO
1. It is a small business firm as defined on page 3.		
2. The primary employment of the principal investigator will be with the firm at the time of award and during the conduct of the		
3. A minimum of two-thirds of research will be performed by this firm in Phase 1.		
4. It Qualifies as a minority and disadvantaged small business as defined on page 3. Circle one: 1- Native American 2-Asian American 3-African American 4-Pacific Islander 5-White 6-No Response		
5. It qualifies as a woman-owned small business as defined on page 4.		
6. It will permit the government to disclose the title and technical abstract page, plus the name, address and telephone number of the corporate official if the proposal does not result in an award to parties that may be interested in contacting you for further information or possible investment.		

PRINCIPAL INVESTIGATOR/ PROJECT DIRECTOR	CORPORATE OFFICIAL (BUSINESS)	OTHER INFORMATION
NAME	NAME	YEAR FIRM FOUNDED
SIGNATURE	SIGNATURE	NUMBER OF EMPLOYEES Avg. Previous 12 mos. _____ Currently _____
TITLE	TITLE	HAS THIS PROPOSAL BEEN SUBMITTED TO ANOTHER AGENCY? Yes _____ No ____
DATE TELEPHONE NO. + AREA CODE	DATE TELEPHONE NO. + AREA CODE	IF YES, WHAT AGENCY?
E-MAIL:	E-MAIL:	

PROPRIETARY NOTICE

For any purpose other than to evaluate the proposal, this data shall not be disclosed outside of the Government and shall not be duplicated, used or disclosed in whole or in part, provided that if a funding agreement is awarded to this proposer as a result of or in connection with this submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement. This restriction does not limit the Government's right to use information contained in the data source without restriction. The data in this proposal subject to this restriction is contained on separate proprietary page(s).

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9.0 SUBMISSION FORMS

Department of Commerce/NOAA
Small Business Innovation Research Program
PROJECT SUMMARY

NAME OF FIRM	AMOUNT REQUESTED
ADDRESS	PHONE # FAX#
PRINCIPAL INVESTIGATOR (NAME AND TITLE)	
TITLE OF PROJECT	
SOLICITATION SUBTOPIC NO.	SOLICITATION SUBTOPIC TITLE
TECHNICAL ABSTRACT (LIMIT TO 200 WORDS)	
KEYWORDS	
POTENTIAL COMMERCIAL APPLICATIONS OF THE RESEARCH	

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NOAA/SBIR PROPOSAL SUMMARY BUDGET

FIRM:	PROPOSAL NUMBER: (Leave Blank)
PRINCIPAL INVESTIGATOR:	
	TOTAL PRICE
DIRECT LABOR:	$
OVERHEAD RATE: 0.00%	$
OTHER DIRECT COSTS:	$
MATERIALS:	$
GENERAL AND ADMINISTRATIVE (G&A): 0.00%	$
PROFIT: 0.00%	$_____
TOTAL PRICE PROPOSED:	$_____
TYPED NAME AND TITLE:	SIGNATURE:
THIS PROPOSAL IS SUBMITTED IN RESPONSE TO NIST SBIR PROGRAM SOLICITATION 2001-1 AND REFLECTS OUR BEST ESTIMATES AS OF THIS DATE. **DATE SUBMITTED:**_____	

BUDGET INSTRUCTIONS

The offeror is to submit a cost estimate with detailed information for each element, consistent with the offeror's cost accounting system. This does not eliminate the need to fully document and justify the amounts requested in each category. Such documentation should be contained, as appropriate, on a budget explanation page immediately preceding the budget in the proposal.

1. Principal Investigator (PI).

The PI must be with the small business concern at the time of contract award and during the period of performance of the research effort. Additionally, more than half of the PI's time must be spent with the small business firm during the contract performance.

2. Direct Labor.

All personnel (including PI) must be listed individually, with the projected number of hours and hourly wage.

3. Overhead Rate.

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable overhead rate may be requested, which will be subject to approval by NOAA.

4. Other Direct Costs.

List all other direct costs which are not described above (i.e. consultants, subcontractor, travel, and equipment purchases). Each of the above needs a detailed explanation and elaboration of its relation to the project.

5. Materials.

The materials and supplies required for the project must be identified. There is also a need to specify type, quantity, unit cost, and total estimated cost of these materials and supplies.

6. General & Administration (G&A).

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable G&A rate may be requested, which will be subject to approval by NOAA.

7. Profit.

The small business may request a reasonable profit (about 7 percent of costs is the average proposed).

CHECKLIST OF REQUIREMENTS

Please review this checklist carefully to assure that your proposal meets the NOAA requirements. Failure to meet these requirements may result in your proposal being returned without consideration. **Six copies of the proposal must be received by Noon EST January 17, 2001.**

_____ 1. The proposal is **25 PAGES OR LESS** in length.

_____ 2. The proposal is limited to only **ONE** of the subtopics in Section 8.

_____ 3. The proposal budget is for **$75,000 or LESS** (or $50,000 0r less for those subtopics designated as "SG"). No more than one-third of the budget goes to consultants and/or subcontractors.

_____ 4. The abstract contains **no proprietary information** and does **not exceed** space provided on the Project Summary.

_____ 5. The proposal contains only pages of 21.6cm X 27.9cm size (8 ½" X 11").

_____ 6. The proposal contains **an easy-to-read font (fixed pitch of 12 or fewer characters per inch or proportional font of point size 10 or larger) with no more than 6 lines per inch,** except as a legend on reduced drawings, but not tables.

_____ 7. The **COVER PAGE** has been completed and is **PAGE 1** of the proposal.

_____ 8. The **PROJECT SUMMARY** has been completed and is **PAGE 2** of the proposal.

_____ 9. The **TECHNICAL CONTENT** of the proposal begins on **PAGE 3** and includes the items identified in **SECTION 3.3.3** of the solicitation.

_____ 10. The **SBIR PROPOSAL SUMMARY BUDGET** has been completed and is the **LAST PAGE** of the proposal.

_____ 11. The P.I. is employed by the company.

NOTE: Proposers are cautioned to be careful of unforeseen delays that can cause late arrival of proposals, with the result that they may be returned without evaluation.

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